

HCB Chain-Block Chain Based Health Care Management System

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Abstract

Blockchain is evolving to be a trust worthy platform for data sharing with earth most security which widen the application areas of blockchain in supply chain management, financial sector, food industries, internet of thing, energy sector, health care etc. Blockchain is gaining popularity is an effective tool that provide solution to the health care industries prevailing problem by managing and securing e-health record. This paper comprises the review of available literature and blockchains applicability in health care management system and a proposal of new model. Which can be implemented to manage health care ecology using blockchain technology for better and secure data management? Our proposed model integrates various medical work flow in a single network using selective combination of consensus algorithm. These will be access and management of huge amount of medical data effectively and securely. It will leverage the unique properties of blockchain and authenticated and accountable, immutable and comprehensive solution for patients and service provider.

Keywords: Block Chain, Health Care, Data Management.

Introduction

In this era of data management blockchain is more authenticated distributed system which makes it a promising technology for storing and handling of data. Generally, blockchain depends on cryptographic technique which allow each of its participants in a established network to view, exchange or store information without any prerequisite of trust. Due to its decentralized nature, there is no central regulation but the record is store and share across all the participants of the network. To meet Hugh demand of data transferring [1] researcher have suggested some model on cloud storage and cloud computing technology which gives proper solution to justify processing demand and compression of storage. Moreover, it has some significate cheat false in case of hospital data management by using apex cloud cervices which has change of exposing the data content. The cryptographic model has been proposed my many researchers to mitigate the problem regarding sharing of medical data but still they have certain limitations [2][3]. For nursing homes and hospitals, the enormous volume of data store with the third parties is not reaches the desired level of assurance [4]. Generally, this semi-credible third parties may exploit this data and divulge user privacy. There is lagging of security in the communication among patient, Health Institute & Insurance Company. Still there is no such work whereas most of the consensus protocols are not compatible with smart healthcare frame work. Motivated by these factors we have done our research on sharing various medical information by designing a new model to manage existing loopholes, at the priorities patient requirement. The section 2 consist of Literature Review, in the 3rd section proposed model is described, section 4 concludes with conclusion and future work is described in section5.

Related work

In this section we discuss various application in block chain especially in healthcare system or healthcare data management which add leverage over the traditional healthcare management system.

- Akkaoui et al. [1] proposed a hybrid edge Blockchain-based framework for health data exchange. (Edge Medi Chain). Which has high block generation throughput with minimum between two Blockchain Period. They claimed Minimum transaction cost for their model. Though they Communication with the healthcare insurance company and analysis of security key is not well defined in their work.
- Sheng Cao et al. [4] suggested a secure cloud – assistant system (TP-HER) to stop illegal alteration with the help of Ethereum based technology. They established well secure system even any malicious user attempt to temper the data. With the error lessness and best integrity, their mode so greater efficiency.
- In [11] the authors have designed the components of their proposed system nodes to integrate with existing EHR infrastructure. It is assumed that many nodes, and in particular care providers, already trustfully manage databases with patient data stored on servers with network connectivity. Their proposed model includes four software components: Backend Library, Ethereum Client, Database Gatekeeper and EHR Manager.
- Israel Deaconess Center. Patientory [12] is one of the early blockchain based healthcare startup leveraging Initial Coin Offerings (ICO) for funding. It is developing a HIE powered by its own blockchain.
- HealthSuite Insights of Philips Healthcare is testing Verifiable Data Exchange Process, a product that enables the secure and traceable data exchange between the members inside a network of hospitals and universities [13]; all the data exchanges inside the network are stored in a blockchain alongside the identities of the people performing the exchanges to create an audit trail of the data exchange.
- Medshare [14] provides a blockchain based data sharing of electronic medical records among untrusted parties by introducing data provenance, auditing, and trailing on medical data. Utilizing smart contracts and an access control system, they claim that their system can effectively trace the behavior of the data and revoke access to violated rules and permissions on the data.
- Iryo [15] is creating a global repository of health data in OpenEHR format

In the following table the comparative analysis is given among various existing block chain based methods for health care management system.

Table 1. Comparative study of some existing Block Chain in Health Care System.

Author	Year	Objective	Pros	Cons
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Akkoui et al. [1]	2020	To Present A hybrid edge. Blockchain-based framework for health data exchange. (Edge Medi Chain).	1. Increase computational capabilities. 2. Minimum transaction cost.	1. Communication with the healthcare insurance company. 2. Security key analysis.
Zghaibeh et al. [2]	2020	To developed A Blockchain-Based Health System with Smart Contracts Capabilities.	1. More compatible with the Hyperledger Fabric.	1. Data privacy is not established properly.
Tanwar et al. [3]		To Propose a Blockchain-based electronic healthcare record system for healthcare 4.0 applications	1.Immutability	1.Latency & network security is not estimated.
Cao et al. [4]		To Design A Toward Secure Storage in Cloud-based eHealth Systems: A Blockchain-Assisted Approach.	1. Cloud based e-Health system. 2. Resistance against data leakage.	1. Have no multi cloud Blockchain assistance
Liu et al. [5]	2019	To Propose a Blockchain-Based System for Anti-Fraud of Healthcare Insurance.	1. Communicate with insurance company.	1. Have no verification procedure.
Xu et al. [6]	2019	To Propose A blockchain-based privacy preserving scheme for large-scale health data (Health Chain).	1. Patient data is secured.	1. Insurance company not connected. 2. Key analysis, Cost complexity analysis.
Yang and Li. [7]	2018	To design architecture for secure EHR based on blockchain.	1. Secure records model.	1.Implementation.
Chen et al. [8]	2019	To design a searchable encryption for EHR using blockchain.	1.Security analysis with searchable encryption algorithm.	1.Scalability.
Liu et al. [9]	2019	Blockchain-Enabled Contextual Online Learning Under Local Differential Privacy for Coronary Heart Disease	1. Edge computation.	1. Real-Time analysis not possible.

		Diagnosis in Mobile Edge Computing.		
Fan et al. [10]	2018	To Provide an Efficient and Secure Medical Data Sharing Via Blockchain. (MedBlock)	1.Allows the efficient EMRs access and EMRs retrieval. 2.Provides information security.	1. Have no interaction with insurance company.

Conclusion

After going through reputed research work, a smart healthcare framework based on blockchain technology is designed. Where doctor, patient, insurance company and other providers will be communicated securely. Our proposed model will be formed by the combination of Private and Public block chain, so that the informations of the patients can be kept secured from outside world. At the same time the informations are accessed throughout universe.

Future Work

In future this block chain model will be incorporated with the IoT devices through which the patients information can be gathered without human intervention. After collecting the data from IoT devices the block chain can trigger events and the patients workflow start working.

References

1. Akkaoui, R., Hei, X., & Cheng, W. (2020). EdgeMediChain: A Hybrid Edge Blockchain-Based Framework for Health Data Exchange. *IEEE Access*, 8, 113467-113486.
2. Zghaibeh, U. Farooq, N. U. Hasan and I. Baig. (2020). SHealth: A Blockchain-Based Health System with Smart Contracts Capabilities. *IEEE Access*, 8, 70030-70043. DOI: 10.1109/ACCESS.2020.2986789.
3. Tanwar,Sudeep, Parekh, Karan , Evans, Richard. (2020). Blockchain-based electronic healthcare record system for healthcare 4.0 applications. *Journal of Information Security and Applications*,50,102407. DOI <https://doi.org/10.1016/j.jisa.2019.102407>.
4. Cao, S., Zhang, X. and Xu., R. (2020). Toward Secure Storage in Cloud-based eHealth Systems: A Blockchain-Assisted Approach. *IEEE Network*, 34 (2), 64-70. DOI: 10.1109/MNET.001.1900173.
5. Liu, W., Yu, Q., Li, Z., Su, Y., and Zhou, J.(2019). A Blockchain-Based System for Anti-Fraud of Healthcare Insurance. *2019 IEEE 5th International Conference on Computer and Communications (ICCC)* pp. 1264-1268, Chengdu, China.
6. Xu, Jie, Xue, K., Li, S., Tian, H., Hong, J., Hong, P., Yu, N.(2019). Health chain: A blockchain-based privacy preserving scheme for large-scale health data. *IEEE Internet of Things Journal* 6 (5) 8770–8781.
7. Yang G , Li C . (2018). A design of blockchain-based architecture for the security of elec-tronic health record (EHR) systems. *2018 IEEE International conference on cloud computing technology and science (CloudCom)*.

8. Chen L , Lee WK , Chang C-H , Raymond Choo K-K , Zhang N.(2019) . Blockchain based searchable encryption for electronic health record sharing. *Fut Gener Comput Syst*, 95 .
9. Liu, X., Zhou, P., Qiu, T. and D. O. W. ,(2020). Blockchain-Enabled Contextual Online Learning Under Local Differential Privacy for Coronary Heart Disease Diagnosis in Mobile Edge Computing. *IEEE Journal of Biomedical and Health Informatics*, 24(8),2177-2188.
10. Fan, K., Wang, S., Ren, Y. *et al.* (2018). MedBlock: Efficient and Secure Medical Data Sharing Via Blockchain. *J Med Syst* 42, 136. <https://doi.org/10.1007/s10916-018-0993-7>
11. Asaph Azaria, Ariel Ekblaw, Thiago Vieira, Andrew Lippman. (2016). MedRec: Using Blockchain for Medical Data Access and Permission Management. *2nd International Conference on Open & Big Data 2016*.
12. Chrissa Mcfarlane, Michael Beer, Jesse Brown, and Nelson Prendergast. Patientory - Whitepaper. (May):1–19, 2017. 14 A PREPRINT- DECEMBER 10, 2018
13. Khalifeh Ahmad.(2020).Blockchain Technology and its Implementations in Medical and Healthcare Field, *INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT)* Volume 09(09).
14. Xia, Qi, Sifah, Emmanuel Boateng, Asamoah, Kwame Omono,Gao, Jianbin, Du, Xiaojiang, and Guizani, Mohsen. (2017).MeDShare: Trust-Less Medical Data Sharing among Cloud Service Providers via Blockchain. *IEEE Access*, 5:14757–14767,. ISSN 21693536. doi: 10.1109/ACCESS.2017.2730843
15. Global participatory healthcare ecosystem. (n.d.). Retrieved from https://iryo.network/iryo_whitepaper.pdf